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CRITICAL REVIEW

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The potential role of chitosan-based nanoparticles as drug delivery systems in pancreatic cancer

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Abstract

Pancreatic cancer (PC) is one of the most lethal cancers and 12th most common cancer in the world. Due to the inaccessible anatomical position of the pancreas and asymptomatic early stages of this disease, PC has a high mortality rate. Therefore, providing reliable diagnostic and therapeutic tools are the keys to increase the PC survival rate. Nanotechnology is an inchoate field of science that previously scientists' tendency to enhance the efficacy of current preventive, diagnostic, and therapeutic methods has oriented them to build a bridge between this science and medicine. In the case of PC, nanotechnology suggests using drug delivery devices for a more effective and targeted therapy. Chitosan is a natural polymer that recently has attracted a lot of attention for being renewable, nontoxic, and bioabsorbable. In this article, we tend to look for the answer to this question: has nanotechnology been successful in using chitosan-based nanoformulations as carriers for preventing more individuals from suffering or at least increasing the 5-year survival of the PC patients?

KEYWORDS

chitosan, nanoparticle, nanotechnology, pancreatic cancer

1 | INTRODUCTION

The pancreas is one of the most critical components of the body that is located behind the stomach in the abdomen and is divided into a head, neck, body, and tail.[1] The importance of this organ is because of its twofold function in the endocrine and digestive system. As a result, the pancreas is made up of two parts with different cells and functions: an endocrine and an exocrine part. The endocrine component is known for its hormone secretion such as insulin, glucagon, somatostatin, and pancreatic polypeptide and its role in blood sugar-regulating and the exocrine component has an essential part in the digestion of fats, carbohydrates, and proteins in the duodenum.[1] These data show that any disturbance in this organ would disarrange the function of the digestive and endocrine system and would put the patient's body in a lot of problems.

Pancreatic cancer (PC) is one of the many complications that take place in the pancreas. We put the name of PC on a malignant condition in which accidental mutations occur in the growth regulator genes of the pancreatic somatic cells. These mutated somatic cells disturb the balance of pancreas performance by invading, wreaking, and eroding its normal cells.[2] This cancer is one of the most lethal cancers around the world in which its mortality rate is approximately 100% and in the best condition, its 5-year survival rate was reported only 9% (in 2019).[3–5] Nutritional and metabolic derangements[6,7]

Abbreviations: antiHER2, Antihuman epidermal growth factor receptor-2; c-SLN, chitosan-coated solid lipid nanoparticles; DD, deacetylation degree; DOX, doxorubicin; FA-Chi-Gem, folate-chitosan-gemcitabine; IL-2, interleukin-2; NPs, nanoparticles; PC, pancreatic cancer; VEGF, vascular endothelial growth factor.

